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Copy 5DEVELOPMENT OBJECTIVES-SIMULATED IMAGERY1. INTRODUCTION

These objectives describe the background, concept, and requirements of a Government-sponsored research and development program in simulated imagery as it relates to, and will be used in, the imagery exploitation process.

2. BACKGROUND

2.1 Proper pre-acceptance testing and evaluating of imagery exploitation instruments and systems at a Contractor's site is complicated by the lack of suitable unclassified imagery. The Government is developing several sophisticated imagery exploitation systems incorporating such features as autocorrelation, stereo tracking, automatic setting of optical components, and anamorphic corrections -- which would benefit from the availability of that unclassified imagery.

2.2 Furthermore, in order to have suitable imagery exploitation equipment and computer programs ready when sophisticated new camera systems become operational, simulated imagery depicting the major geometric distortions introduced by the new systems should be made available at an early date in order to prepare, test, and evaluate the necessary equipment and programs required for exploitation prior to their operational use.

3. CONCEPT

This program is directed toward the development of a computer program for the UNIVAC 404 that will provide the capability for making a graphic plot to serve as simulated or artificial imagery. The primary intended use of the simulated imagery is to test and evaluate equipment that is already developed or under development. In addition, the imagery would be utilized to test and evaluate new math model programs for the exploitation of operational acquisition systems, and could serve as a test bed to prepare and debug computer programs for future camera systems.

4. GENERAL DESCRIPTION

4.1 The end product of this program will be a computer program (or programs) and computer generated graphics of stereo pitched panoramic formats, of stereo strip and oblique strip formats, and of formats of a special stereo acquisition system under development.

4.2 The artificial or simulated imagery should appear on the film formats as a grid pattern that has been photographed by either a panoramic or strip camera system. In the panoramic camera simulation, the imagery of the grids should appear distorted to indicate the effects of panoramic sweep, forward and aft pitch angle, and the results or proper and improper image motion compensation. In the strip camera simulation, the imagery of the grids should depict the distorted effects of obliquity, effects of V/H ratio, film velocity, etc. In both the panoramic and strip simulated imagery, it is required that the program and the graphics be capable of displaying the major geometrical distortions inherent in the respective camera systems.

4.3 This project is not directed to obtaining aerial photography simulation by use of three dimensional models. Specifically, this project is not aimed at producing photographs of terrain scale models at varying lighting conditions with miniature short focal length cameras. Furthermore, this project is not directed toward generating photographs with specified spread function, tonal scale, or image size by altering original photographs through a modified contact-printing technique.

## 5. DETAILED OBJECTIVES

5.1 The Contractor will be required to supply programs, procedures, and materials to perform the following tasks and produce acceptable artificial simulated imagery. As envisioned, computer programs will accept the appropriate flight and camera parameters of a selected acquisition system along with the known, measured coordinates of a grid system; distort the grid pattern to depict the geometrical distortions inherent in the selected acquisition system (panoramic sweep, strip film velocity, image motion compensation, etc.); and provide an output to a standard digital coordinate plotter to plot the resultant distorted grid as it would appear in the film format of the selected acquisition system.

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### 5.3 Computer Program

5.3.1 The computer program or programs must be in a format acceptable to the UNIVAC 494 computer in use at the Government's facility.

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5.3.2 The computer program may be classified, but the resulting plot of simulated imagery should be unclassified.

5.3.3 The computer program will be capable of accepting various changes in parameters, such as: varying the IMC, sweep rate, film velocity, roll angle, and pitch angle.

5.3.4 The computer program will be able to generate artificial imagery, resulting from both idealized parameter inputs and imagery resulting from improper inputs, such as errors in IMC and sweep rate.

5.3.5 The computer program output will be in a format acceptable for plotting the required distorted grids on the standard commercial plotters currently in use at the Center;

5.3.6 If short programs or tapes are required to drive the recommended plotters, they will be supplied by the Contractor.

#### 5.4. Graphic Printout

5.4.1 The graphic printout will be plotted in actual operational formats and lengths (or at a scale that can be easily reduced or enlarged to the operational size).

5.4.3 The graphic printouts will be of quality acceptable for use as a master for subsequent photographic reproduction.

#### 5.5. Simulated Imagery End Product

5.5.1 One of the intended uses for the simulated imagery is to test and evaluate advanced imagery exploitation systems.

5.5.1.1 The size (scale) of the distorted grids (or the spacing of the line traces) is quite critical because this imagery is to be used on instruments that have optical zoom ranges covering 10X to 200X, anamorphic stretch ratios of 2.2 to 1, autocorrelation of stereo imagery, and automatic setting of optical elements in stereo scanning.

5.5.1.2 The Contractor is encouraged to use his initiative if a better idea for the simulated imagery is evident.

5.5.1.3 This artificial imagery must be precise enough to test the autocorrelation systems on several advanced instruments. The distorted grids are to very closely approximate the "real world condition" that is ordinarily encountered in viewing panoramic and strip photography in the stereoscopic mode.

5.5.2 Another prime use for the simulated imagery will be to check out computer programs for existing and planned camera systems.

5.5.2.1 This artificial imagery will be used in testing several stereo viewing systems that incorporate small integral digital computers. In these cases, the computers determine the precise optical settings and the stereo stage tracking, etc. required to fuse and scan stereoscopic imagery. The artificial imagery will be used to test the ability of these computer programs to properly perform these functions.

5.5.2.2 The artificial imagery will also provide a means to have computer data reduction programs ready when operational imagery becomes available from new camera systems. The simulated imagery would be used to prepare programs for the central 494 computer, the special purpose computer in AP-3 analytical plotter, and the small Honeywell 516 computers to be used in the Automatic Stereo Scanner and the High Precision Stereo Comparator.

## 6. TECHNICAL REQUIREMENTS

6.1 The Contractor is expected to have an expert awareness of the major camera systems that produce most of the imagery being used by the Government.

6.2 The Contractor must be capable of determining the dynamic range and limitations of the three major camera systems in question.

## 7. AREAS OF INVESTIGATION

The Contractor will be able to obtain enough information on the camera systems from the classified technical reports and from the operational imagery.

## 8. MISCELLANEOUS

8.1 Level of Effort - This project is intended to be less than a six-month level of effort and to be completed with FY-1969 funds.

8.2 Proposals - The potential bidders are required to review the objectives and break the project into programs or tasks. The proposal must be comprehensive, well organized, explicit, clear, concise, and limited in content to that information required to qualify the prospective bidder and demonstrate ability to perform satisfactorily within the scope of this document. The format of the proposal must be arranged to separate company and personnel qualification sheets from the main body of the proposal.

8.3 Administration - The Government will retain overall control of this program. Written approval from the contracting officer must be obtained before any changes in objectives, costs, or priorities are effected or before any subcontractor or consultant is employed.

8.4 Contractor Responsibility - The Contractor is expected to provide competent and cooperative administrative service. He will be vested with certain authority to control the direction and degree of technical effort within the bounds of the estimated costs. As a part of his overall responsibility, the contractor will be responsible for the work performed by all of his subcontractors and consultants, if any. The fact that the Government has granted approval of the use of a specific subcontractor or consultant (see Paragraph 8.3) in no way relieves the contractor of this responsibility.

8.5 Technical Representatives - The contracting officer will designate a technical representative to authorize specific development efforts of the contractor. Such authorization will be given in writing in its original form or in confirmation of an oral authorization. The contractor will accept no other authorization except that of the technical representative or contracting officer.

8.6 Reports - Regular reports will be required throughout the life of the contract. All reports will meet the basic requirements of specification DB-1001, dated 31 August 1966, GENERAL REQUIREMENTS FOR CONTRACTUAL DOCUMENTATION, attached hereto.

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